

What is claimed is:

1. An ion implantation system, comprising:

an ion source operable to generate a ribbon ion beam;

a mass analysis system operable to receive the ribbon ion beam at an entrance end and deflect ions within the ribbon beam having a desired charge-to-mass ratio along a predetermined path for output at an exit end, the mass analysis system further comprising a field clamp located at one of the entrance end and exit end, the field clamp operable to substantially terminate a fringing field associated therewith, thereby reducing a distortion of the ribbon beam; and

an end station downstream of the mass analysis system, operable to support a workpiece for implantation thereof *via* the ribbon ion beam.

2. The system of claim 1, wherein the field clamp comprises two iron members extending in a direction associated with a width of the ribbon beam, wherein the first iron member is positioned above the ribbon beam, and the second iron member is positioned below the ribbon beam, respectively.

3. The system of claim 1, wherein the mass analysis system comprises a first field clamp located at the entrance end and a second field clamp located at the exit end, respectively.

4. The system of claim 3, wherein the first and second field clamps each comprise two iron members extending in a direction associated with a width of the ribbon beam, wherein the first iron member is positioned above the ribbon beam, and the second iron member is positioned below the ribbon beam, respectively.

5. The system of claim 1, wherein the mass analysis system further comprises a pair of coils having a beamline path disposed therebetween, wherein the coils are operable to generate a magnetic field substantially perpendicular to a propagation direction of the ribbon ion beam when current conducts therethrough.

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6. The system of claim 5, wherein the pair of coils extend in a width direction of the ribbon ion beam and define first and second opposing side portions of the mass analysis system on either end of the coils.

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7. The system of claim 6, further comprising a first set of secondary coils extending in height direction of the ribbon beam along the first and second opposing sides, respectively, wherein the first set of second coils, in conjunction with pair of coils operate as a quad coil to adjust a focus or parallelism at ends of the ribbon beam.

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8. The system of claim 6, further comprising a second set of secondary coils extending in a width direction of the beam and superimposed over the pair of coils, wherein the second set of second coils is operable to conduct current therethrough independently of current in the pair of coils, thereby providing for a compensation for the dipole magnetic field between the pair of coils.

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9. The system of claim 8, wherein the second set of secondary coils comprise an upper and lower set of secondary coils, wherein the upper and lower set are independently controllable for providing compensation for the dipole magnetic field.

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10. A mass analyzer comprising:

a pair of coils arcuately extending between an entrance end and an exit end, and having an arcuate beamline path disposed therebetween; and

5 a field clamp operably coupled to one of the entrance end and the exit end of the coils, and operable to substantially terminate fringing fields emanating from one of the entrance end and the exit end of the coils, respectively.

11. The mass analyzer of claim 10, further comprising another field clamp operably coupled to the other of the entrance end and the exit end of the coils.

10 12. The mass analyzer of claim 10, wherein the pair of coils comprises a first coil defining a top portion and a second coil defining a bottom portion of the mass analyzer, and wherein the field clamp comprises a first iron member positioned at the entrance end of the first coil, and a second iron member positioned at the  
15 entrance end of the second coil, and wherein the first and second iron members operate to substantially terminate fringing fields emanating out of the entrance end of the coils.

20 13. The mass analyzer of claim 12, wherein the first and second coils further extend in a direction substantially perpendicular to the arcuate beamline path and defining a width of the mass analyzer, and wherein the first and second members extend along the width of the mass analyzer at the entrance end of the first and second coils, thereby substantially terminating fringing fields emanating out of the entrance end of the coils along the width of the mass analyzer.

25 14. The mass analyzer of claim 10, wherein the pair of coils comprises a first coil defining a top portion and a second coil defining a bottom portion of the

mass analyzer, and wherein the field clamp comprises a first iron member positioned at the exit end of the first coil, and a second iron member positioned at the exit end of the second coil, and wherein the first and second iron members operate to substantially terminate fringing fields emanating out of the exit end of the coils.

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15. The mass analyzer of claim 14, wherein the first and second coils further extend in a direction substantially perpendicular to the arcuate beamline path and defining a width of the mass analyzer, and wherein the first and second members extend along the width of the mass analyzer at the exit end of the first and second coils, thereby substantially terminating fringing fields emanating out of the exit end of the coils along the width of the mass analyzer.

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16. A method of mass analyzing a ribbon shaped ion beam, comprising:  
generating a dipole magnetic field for deflection of selected ions in the ribbon beam along a predetermined path; and  
limiting an extent of fringing fields associated with the dipole magnetic field.

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17. The method of claim 16, wherein limiting the extend of the fringing fields comprises clamping the fringing fields within a predetermined area.

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18. The method of claim 16, wherein the dipole magnetic field is generated within a mass analyzer having an entrance end and an exit end, respectively, and wherein limiting an extent of the fringing fields comprises limiting the extent the fringing fields emanate from the entrance end or the exit end of the mass analyzer.

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19. The method of claim 18, wherein the extent of the fringing fields comprises clamping the fringing fields within a predetermined area proximate the entrance end or the exit end of the mass analyzer.

5           20. The method of claim 19, wherein clamping the fringing fields comprises placing a field clamp proximate the entrance end or the exit end of the mass analyzer.

10           21. The method of claim 20, wherein a distance between the field clamp and the entrance end or the exit end of the mass analyzer is sufficient to prevent saturation of the field clamp.

15           22. The method of claim 20, wherein the field clamp comprises an iron member having a top portion and a bottom portion, the top and bottom portions each extending along a width of the ribbon beam, wherein the ribbon beam passes therethrough.

20           23. The method of claim 16, further comprising detecting a uniformity of the ribbon beam after limiting the extent of the fringing fields.

24. The method of claim 23, wherein detecting the ribbon beam uniformity occurs at or near a workpiece being implanted with the ribbon beam.

25           25. The method of claim 23, wherein the dipole magnetic field is generated within a mass analyzer, further comprising controlling one or more coils associated with the mass analyzer based on the detected ribbon beam uniformity.